

# PATENT SPECIFICATION

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DRAWINGS ATTACHED

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(2) DE - Uspatent

## (54) INJECTION MOULDING SYNTHETIC PLASTICS ARTICLES

(71) We, BAYER AKTIENGESSELLSCHAFT (formerly Farbenfabriken Bayer Aktiengesellschaft), a body corporate organised under the laws of Germany of 509 Leverkusen, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a method for injection moulding synthetic plastics compound articles having a compact outer layer and a foamed core. In the method, firstly, material free from blowing agent and, thereafter, material containing blowing agent are injected through the same sprue into the mould. For this purpose, an injection moulding machine is used.

An object of the invention is to make it possible to manufacture light but strong moulded parts which have good surface properties.

It is known to provide a multi-way cock in a supply line to the mould, which can be changed over to two different injection machines, one of which supplies a material without blowing agent and the other a material with blowing agent. This arrangement has the advantage that, for marginal zone and core, quite apart from the addition of blowing agent for the core, it is possible to use different materials. However, it has been found that it is perfectly feasible to make the marginal zone and core of the same basic material, and it is only necessary for a blowing agent to be added to the basic material in order to form the foamed core. The use of two injection machines for this purpose is, of course, very costly and unproductive, since the two injection machines can only operate alternately.

An aim of the present invention is to provide a method permitting synthetic plastics compound elements to be made relatively simply and cheaply.

According to the invention there is provided a process for injection moulding synthetic plastics compound articles with a dense outer layer and a foamed core, in which initially material without a blowing agent is injected through a sprue into a mould in sufficient quantity to form the outer layer, and thereafter the material being injected into the mould through the sprue has a blowing agent introduced therein just before the material enters the mould, the introduction of blowing agent lasting until the quantity of material required for forming the core has been injected into the mould.

In a preferred embodiment of the invention, material free from blowing agent is subsequently injected into the mould, in order also to ensure a compact surface at the point of injection.

One apparatus for use in the process according to the invention comprises an injection moulding machine having a mould and means for injecting material into the mould; and means including at least one nozzle connected to a storage reservoir for a blowing agent, for intermittently supplying blowing agent to the material prior to its entry into the mould.

The above-mentioned nozzle is advantageously connected by a control device to the injection moulding machine. The injection time of the material free from blowing agent and the injection time of the blowing agent are advantageously controlled through time relays, since the injection quantities per unit of time can be determined. In this way, the correct ratio between materials free from and the materials containing blowing agent can be adjusted.

Because of this simple method of introducing the blowing agent into the stream of material which does not itself contain any blowing agent, a second injection moulding machine becomes superfluous. Indeed, were such a machine to be provided it would

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require particular care as regards cleaning, because of the blowing agent-containing material to be processed. With the apparatus described above, on the contrary, there are no soiling effects nor does a foaming of the blowing agent-containing material occur in the feeder, since this is avoidable by shutting off the supply of blowing agent at the correct time, so that only material without blowing agent is in the feeder at the end of the injection moulding operation.

ABS-Polymers, polystyrene, thermoplastic polyurethanes, polyethylene, polyvinyl chloride, polycarbonate, polyoxymethylenes and cellulose derivatives are especially suitable as basic materials.

Solvents with a boiling point advantageously between 20 and 150°C., for example, fluorochloroalkanes, n-hexane, cyclohexanes and methylene chloride, are suitable as blowing agents.

An example of the process according to the invention is now to be more fully explained by reference to the accompanying drawing.

An injection moulding machine 1 (shown in longitudinal section) melts material without blowing agent and injects it through a feeder 2 and a sprue 3 into an internal cavity 4 of an injection mould 5. Material free from blowing agent is injected in sufficient quantity to form the marginal zone, the injection time for the material being determined through a time relay 6 by the drive means of the injection moulding machine. A pump 7 is then operated through the same time relay to supply blowing agent from a storage reservoir 8 to a nozzle 9 by which it is introduced into the stream of material free from blowing agent, which comes from the injection moulding machine.

The material, now containing blowing agent, passes through the sprue into the internal cavity of the mould and displaces the previously introduced blowing agent-free material on to the internal surfaces of the mould thus forming a dense, solid outer

shell 10 for the moulded element whose core 11, after completion of the foaming reaction, consists of foam material.

It is possible to dispense with the pump, provided the storage reservoir 8 is under a sufficiently high pressure. In this case, the nozzle 9 is opened for the necessary length of time by means of the time relay 6.

The introduction of blowing agent is stopped before the injecting operation by the injection moulding machine 1 is completed, so that the injection moulded component is provided on all sides in the marginal zone with material not containing blowing agent. This also has the advantage that no material is able to complete foaming in the feeder 2.

#### WHAT WE CLAIM IS:—

1. A process for injection moulding synthetic plastics compound articles with a dense outer layer and a foamed core, in which initially material without a blowing agent is injected through a sprue into a mould in sufficient quantity to form the outer layer, and thereafter the material being injected into the mould through the sprue has a blowing agent introduced therein just before the material enters the mould, the introduction of blowing agent lasting until the quantity of material required for forming the core has been injected into the mould.

2. A process according to claim 1, in which material without blowing agent is subsequently injected into the mould.

3. A process for injection moulding synthetic plastics compound articles, substantially as herein described with reference to the accompanying drawing.

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Reference has been directed in pursuance of section 9, sub-section (1) of the Patents Act 1949, to Patent No. 1,156,217.

1333587

COMP SPECIFICATION

1 SHEET

*This drawing is a reproduction of  
the Original on a reduced scale*



